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TELEPHONE NUMBER

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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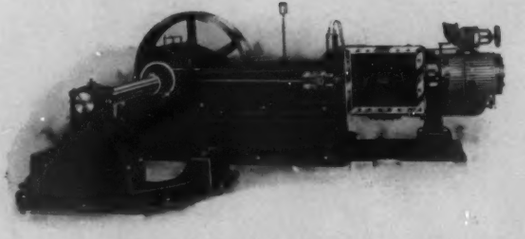

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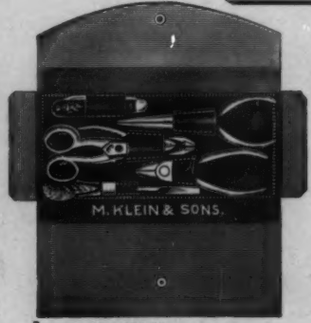

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JOURNAL OF ELECTRICITY

POWER AND GAS

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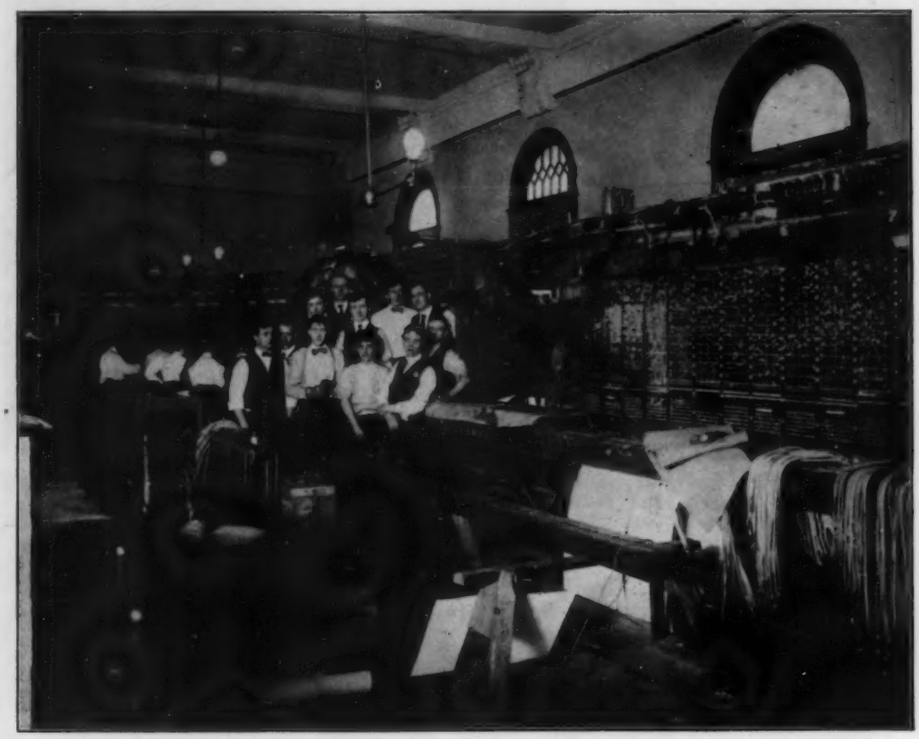
VOLUME XXII. SAN FRANCISCO, MAY 8, 1909. NUMBER 19

RAPID SWITCHBOARD RECONSTRUCTION

A fire, which probably started near the cord terminals in the first position of the "A" board in the main office, Portland, Ore., March 20th, entirely destroyed the first, and part of the second section of the switchboard. The fire was first discovered by one of the night switchboardmen at about 5 a. m. An alarm was immediately turned in and the fire department arrived on the scene promptly with the chemical engine. The fire was finally extinguished after it had burned its way through to the top of the top bank of multiples. The liquid extinguishers also wrought considerable damage to cables and jacks which were not touched by the flames.



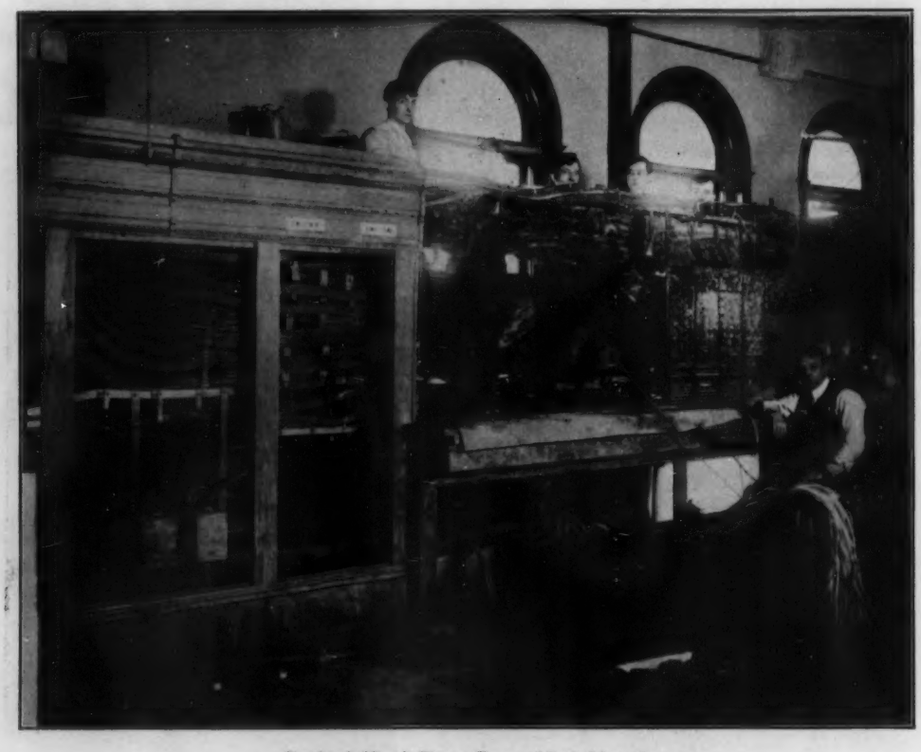
Portland (Ore.) Fire. Face of Switchboard

The fire occurred in nearly the most vital point of the multiple, as the only place where it could possibly have rendered a greater havoc would have been in the T splice, where the "A" and "B" multiples are spliced to the cable terminating on the intermediate distributing frame. As it was, the damage from fire and extinguisher liquid combined, crossed up practically all the lines in the board, which necessitated the opening up of the main battery fuses and leaving them open until the fuses had been disconnected from the relay bays and the line lamps. This, of course, rendered the "A" and "B" boards both entirely useless.

At exactly 6:15 a. m. work was started on cutting away the multiple jacks from the cables in order to clear the lines from crosses and grounds. This was completed about three hours later and relay bays and line lamps were again fused up. While the work of cutting away the damaged jacks and cables was in progress, other men began to splice out the outgoing trunk multiple so that, when the damaged multiple had been cleared, service was restored to subscribers desiring connection with East Tabor, Woodlawn and Sellwood offices. By that time temporary trunks had also been established from the "A" to the "B" boards so that, at about 3 p. m., partial incoming service was restored even to the main subscribers.

The work of splicing together the multiple cables

at the burned section, in order to restore complete service, was then commenced. This was naturally slow work, owing to the limited space in which the men had to work. The work was also retarded as a majority of cables in the front layer of the multiple were burned in half; others were found to be soaked in liquid which necessitated two splices in each of these cables. As the splicers were progressing other men were forming cables and others making continuity tests of finished splices from the "A" to the "B" boards. Others were engaged in making voltmeter tests for leaky cables and clearing trouble. It was also necessary to transfer 440 answering jacks to other panels and establish temporary testing outfits. The men worked in three shifts. Some, however, worked from 12 to 14 hours, expressing their willingness, as well as desire, to do so in order to restore connections. Fairly good service was given all day Sunday, March 21st, and, though somewhat congested, owing to the insufficient number of trunks, service on Monday was practically restored to the 13,500 subscribers whose service had been crippled.



Portland (Ore.) Fire. Face of Switchboard

On the morning of Wednesday, March 24th, there were but 48 lines plugged up on the hospital position. A complete voltmeter test had been made on the night previous, the results of which indicated a few lines as showing escape, which, however, did not interrupt the service. This remarkable restoration was due to the efficient co-operation of all departments, and the officials of the company were the recipients of many commendatory words from the press and public. Through the courtesy of the Pacific T. & T. Co. we reproduce photographs which will give the reader an idea of the difficulties encountered.

WHY TELEPHONE COMPANIES CHARGE MORE FOR SERVICE IN LARGE THAN IN SMALL EXCHANGES.

Nearly every one is familiar with the fact that telephone companies charge more for service in large cities than in small cities and towns, but many do not understand why this is necessary, and some believe that the charges for service should be reduced, rather than increased, as the telephone exchange grows in number of subscribers.

The general public assumes that the telephone furnished each subscriber is the unit of cost of the commodity which the telephone company is selling. It is natural that it does not understand why the company charges more for telephone service in an exchange with a large number of telephones than in an exchange with a small number, and asks why the telephone business differs in this respect from practically all other businesses. This question, while quite generally propounded, is asked under a misapprehension or without due consideration of the real facts.

It can be demonstrated that, as an exchange grows, the cost of furnishing under any particular class of service the unlimited use of the entire system, or plant, to each patron increases, and that an increase in the charge made therefor is necessary. It can also be demonstrated that at the same time the cost per unit has decreased, and that the charges based on any reasonable unit of measurement will show a reduction.

If an exchange with a small number of subscribers the cost of the plant is not very great and its construction is simple. The switchboard is inexpensive and easily maintained, not requiring the service of an expert. The poles are small, and the cables, if any,

are not only small, but of short length. No underground construction is necessary. As the exchange increases in size, these conditions gradually change, and in due course of time it is necessary to have underground conduits, underground cables, multiple switchboards, power plants, and supervisory apparatus of many kinds, and the employment of experts at a greater rate of pay becomes necessary.

To illustrate: A switchboard for an exchange of three hundred lines or less can be purchased at from $1.50 to $3.00 per line, while a switchboard with a maximum capacity of ten thousand lines, but equipped for only six thousand lines, and with fifteen sections installed, would cost about $120,000 or $20 per line, and one fully equipped for ten thousand lines and twenty-five sections installed, which would be necessary to operate that many lines, would cost about $250,000, of $25 per line. Thus it will be seen that on this one item alone the cost in a very large exchange is ten times greater than in a small exchange. This is only one item, and illustrations could be made comparing the cost of underground conduit and cable, underground distribution in the central part of the city, interior block distribution in the suburbs, the cost of real estate, of taxes, of salaries and wages, of damage and compensation, of bad debts, forced reconstruction or replacement due to abnormal growths or requirements of the city. In fact, practically all items of furnishing service in a large city increase as compared with the cost of similar items in a small town, and, when the unlimited use of the entire plant is furnished at a flat rate, this rate must necessarily be larger per station as the city grows and as the exchange grows, and it should not be overlooked that the value of the service to the patron increases just as rapidly.

The telephone company does not sell the telephone on the wall, in the office, or the residence, neither does it rent it to the subscriber. In any exchange where there is a flat rate for the unlimited use of the entire plant, the company places this plant, consisting of switchboards and central office apparatus, underground conduit, cable, poles, wires, etc., all at the subscriber's disposal, and places the instrument in his office or residence in order that the subscriber may be able to avail himself of the different uses of the plant, as his necessities may require.

Assuming that there are two miles of wire per telephone as a fair basis, an exchange of 2,500 telephones will require 5,000 miles of wire to connect them with the central office. If the charge for a special line telephone is $5 per month, it will be seen that the rate charged for the use of the wire is $1 per month per thousand miles of wire. If this exchange grows until there are 5,000 telephones connected with it, and if the average amount of wire for each telephone is still two miles (as a matter of fact the average length of wire for each telephone will have increased), it will require 10,000 miles of wire to connect all of the telephones with the central office. If the rate is still $5 per month for a special line telephone, the rate charged is 50 cents per month per thousand miles of wire, or just 50 per cent as much as was paid for the service when there were only 2,500 stations connected with the exchange. If the same exchange increases to 8,000 telephones and still has an average of two miles of wire per telephone (which is less than will be the case in actual practice), there will be 16,000 miles of wire, and, if a rate of $6 per month is charged for a special line telephone, the subscriber will pay only 37½ cents per month per thousand miles of wire, or only three-eighths as much as he paid when the exchange had only 2,500 telephones in operation.

If the cost of the telephone plant is taken as a basis for making charges and $1,000 is considered as the unit, upon this basis the charges continually grow less and less per unit as the exchange grows. In other words, the cost of the service to each subscriber is not increased in the same proportion as the investment in the plant is increased.

Consider the number of telephones with which the subscriber can talk for an unlimited flat rate per month as the basis of charge for the service. Assuming 5000 telephones and a charge of $5 per month for special line service, it will be seen that the charge is $1 per month for each 1,000 telephones with which the subscriber can be connected. With 10,000 telephones and a flat rate of $6 per month, the charge would be 60 cents per month per 1,000 telephones, or 40 per cent cheaper than the rate charged when there were only 5,000 telephones.

Another unit for computing the charge made and one accepted by many experts, is the message mile; that is, the transmission of one telephone message for a distance of one mile. In a small town, with a small number of subscribers, say 100 or less, the distance between each telephone is not very great and the distance traversed by each conversation is small. On account of the small number of people with whom the subscriber can talk in a small exchange, the number of calls per telephone per day is also small. When the second one hundred telephones are added, each of these subscribers has the opportunity to talk to the first one hundred and also to ninety-nine of the second one hundred. As the exchange grows, so does the town or city, and, in a large city with a large number of telephones, the subscriber is enabled to talk to many people at a very considerable distance. In this way the average number of miles traversed by a telephone conversation is, in a large exchange, much greater than in a small exchange. Statistics from a number of small exchanges, as well as a number of large exchanges, of one of the telephone companies of this country indicate that the average length of wire for each subscriber in a small exchange is less than 1.2 miles, while in an exchange of 10,000 or 12,000 telephones the average is 3.4 miles of wire.

In a given city the average length per line is 2.3 miles. The average length of line used for each telephone conversation is twice this figure, or 4.6 miles. The average number of daily conversations per telephone is eight, including Sundays. This figure multiplied by the length of line used for each conversation, 4.6 gives 36.8 message miles per telephone per day, of 1,104 message miles per telephone per month. The average rate per telephone in this exchange is $4.24 per month. This gives a cost per message mile in this exchange of thirty-eight one-hundredths of a cent.

On the other hand, an average of ten small exchanges of the same company, chosen at random, having an average rate per line of $2.28 per month, shows an average length per line of .8 miles, and the average length of line per conversation is twice this, or 1.6 miles. The average number of daily conversations at these ten exchanges is 4.1 per telephone, including Sundays. This multiplied by the length of line per conversation, 1.6, gives 6.56 message miles per line per day, or 196.8 message miles per line per month. The subscriber pays $2.28 per month, as stated above. This gives a cost per message mile to the subscriber of 1.16 cents. Compare this with .38 cents for the city above referred to in which a large exchange is operated. It is seen that the average cost per message mile to the subscriber in the larger exchange is only 35 per cent of what it is to the subscriber in the smaller exchange, although the average rate per station per month at the smaller exchange is scarcely more than one-half that at the larger exchange.

Unfortunately, in the telephone business there are a large number of fixed charges irrespective of the amount of service performed, and the most of these tend particularly to increase with the size of the exchange, so that it is impossible for a telephone company to sell service at large exchanges in small enough quantities to make the initial price as low as in a very small exchange, even when a specific charge is made for each message over a certain number.

Among these increasing costs are investment, operating, maintenance, engineering, discontinuances, taxes, rent, light and labor. It is also necessary to provide a large proportion of facilities in advance of demand at large exchanges, owing to the fact that in small towns the degree and direction of growth can be much more accurately predicted.

The question of the value of the service to the subscriber is interesting and important. In no other business does this value play so small a part in the mind of the purchaser. Usually, price depends upon a combination of cost to seller and value to buyer. In the real estate business it depends almost wholly on value to buyer. Recent computations show that, if one-half of all telephone connections be assumed to be of a social nature and useless from an economic standpoint, and if it be further assumed that the average value of the time of the telephone user is $900.00 per year and the average time saved for one man twenty minutes per business message (all of these being conservative assumptions), then the average value per telephone to the user is more than five times the average revenue per station to the telephone company. This refers only to the value of the time saved and added to the productive force of the country, and does not include any direct monetary saving, such as messenger fees, car-fare, etc.

The great excess of value over price is more marked at the larger exchanges than at the smaller. The average value of the time of the user is greater in a large city than in a small town, and the amount of time saved by each message is greater, due to the greater distances to be traversed. Conservative figures place the average value of the time saved per business message at ten small exchanges at three cents and at ten large exchanges at twelve cents. These figures, dealing with values only, assign no value to the social and trivial conversations, estimated at one-half of the whole number, although such conversations have some value to the user, which is greater at a large exchange than at a small one, and the cost of handling a conversation is the same to the company, irrespective of its value.

The value of the service to the purchaser becomes important as an element of rate making only when, the average rate necessary to run the business at an adequate profit having been determined, the question arises as to the proper differentials to produce this average rate, to be made between the charges for the different classes of service (business or residence; special line, duplex, or party line; unlimited or message rate, as the case may be). It is a physical impossibility to state the exact relative cost of each of these classes of service. Even if an accounting system were practiced which was sufficiently complex to differentiate the direct cost of each, there would be no reasonable method of apportionment of the fixed and the general charges of the company. In determining these differentials, therefore, recourse is taken to the relative value of the service of each class to the user; and since this can be told within narrow limits from the results of past experiments, taken in connection with the present known conditions, the result is an equitable and fair distribution of charges, leaving them well within the value to the user, and imposing no undue burden upon any one class of business.

THE OTHER SIDE.

During the past few years criticism has been rampant in connection with corporations and corporation management. It is true that in some instances investigation has disclosed irregularities deserving of prompt and effective correction, but as yet it has been found impossible to eliminate the weaknesses of human nature either in individual or corporate activities. The thoughtless reader who has formed his opinions from the headlines of yellow newspapers has possibly come to a belief that a few individuals in the financial world, through combination and unscrupulous methods, are forging shackles of industrial serfdom for all time upon "the people." The sensational space writer, the muck-raker and the politician with his affection for "the people," can certainly claim a degree of doubtful satisfaction in that they have brought about certain results, and it is well to consider who has been affected thereby. The corporation has been found to be the most convenient form of business arrangement. Results are possible under combination which cannot be otherwise attained. Shareholders, busy in their own limited spheres of action, must of necessity entrust the investment of their accumulations to others. Two and one-half million investors own the corporations of America. One-half the workers of this country whose compensation is received in the form of wages or salaries draw these incomes through organized industries. The close competition of the business world, the demand for executive ability and economy of management render necessary a centralization of control, but statistics show that this means anything

but a centralization of ownership. It is estimated that the ownership of the banks of this country is divided among 400,000 shareholders. Through the life insurance companies with their millions of policy holders and the banks with their millions of depositors, it is a safe assumption that over 15,000,000 people, not directly interested in corporate securities, are indirect participants in corporation profits on account of the investment of savings in these securities, which represent for the most part the accumulations of individual self-denial, thrift and enterprise, and which in great degree constitute the protection of the helpless and dependent.

It is the corporation which goes forward in the new country, and villages, homes, churches, schoolhouses and new forms of employment follow. It is well to remember that corporations cannot carry out great improvements without the sale of their stock and bonds. Earnings are not sufficient for extensions of magnitude. Capital is timid and in the face of reckless or ill-considered legislative interference, actual or threatened, will avoid these securities. Continuous agitation retards development and removes initiative. Depression and idleness follow. Mr. Theodore P. Shonts is authority for the statement that contemplated improvements in railroad work involving the expenditure of hundreds of millions of dollars have been recently abandoned on account of the spirit which seems to have taken possession of those whose duty it is to carefully consider proposed legislation. Men will not undertake tasks involving ability, enterprise, resource and patience when at the end they have nothing to expect but harsh treatment thinly disguised as "regulation" amounting oftentimes to practical confiscation. There is no opposition to such regulation as the public welfare may require, but regulation should also mean protection of legitimate operations. It should not be a cloak for unwarranted legislative action which assumes that enterprise and the possession of property are crimes, and which in truth is but the reflection of the whims and jealousies of the envious, the lazy and the discontented. Publicity and not concealment is the policy of the intelligently managed corporation. The average citizen who gains his livelihood through the corporation or industries dependent upon its prosperity, or, being an indirect beneficiary from its operations, joins in the unthinking criticism of the ignorant or malicious, is in the same category as that intelligent individual who seated on the limb of the tree, sawed it off between himself and the trunk.—Ex.

U. S. Government wireless stations on the Pacific Coast are maintained at Colon, Panama; Farallone Islands, Cal.; Mare Island, Cal.; Pt. Arguello, Cal.; Table Bluff, Cal.; Point Loma, Cal.; Puget Sound, Wash.; Cape Blanco, Ore.; North Head, Wash.; Tatoosh Islands, Wash.; Nome, Alaska; Cordova, Alaska; Circle City, Alaska; Fairbanks, Alaska; Wrangell, Alaska; Sitka, Alaska; Ft. Egbert, Alaska; St. Michaels, Alaska; Ft. Gibbon, Alaska; Petersburg, Alaska; Circle City, Alaska; Zamboanga, P. I.; Cavite, P. I.; Island of Guam; Jolo, P. I.; Oahu, Hawaii; Malalong, P. I.

THE DYNAMO AS A LOUD SPEAKING TELEPHONE.

Some interesting experiments have been recently conducted by Professor W. Peukert on sound reproduction according to the German press. As a consequence he has designed a simple and effective form of receiver which is remarkable for its loud speaking qualities. He found first that a ring core,

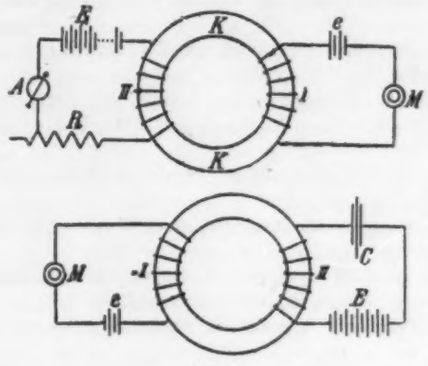


Fig. 1.

consisting of soft iron and surrounded by a winding in series with an ordinary microphone circuit, acted as a telephone receiver. Its loudness was materially increased if a separate winding was added so as to subject the iron to a constant magnetic force, as shown in Fig. 1.

Fig. 2 shows a straight soft iron core, wound with the coil for the microphone circuit and placed between the poles of a permanent magnet, the permanent magnet producing the constant magnetic action necessary. All of the iron particles forming the

Fig. 2.

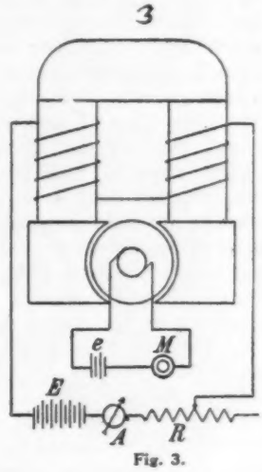


Fig. 3.

closed magnetic circuit vibrate and thus reproduce sound without the usual distortion of the ordinary vibrating membrane.

Fig. 3 shows the microphone circuit in series with the armature winding of a dynamo through its brushes. Separate batteries regulate the resistance and so excite the magnets to the necessary strength. Similarly, an alternating current transformer can be made to act as a receiver by connecting one winding to the microphone circuit and the other to the exciting battery.

ON LIGHTNING ARRESTERS.

Discussion by members of the San Francisco Section of the American Institute of Electrical Engineers of paper on this subject by Mr. A. G. Jones as published in the JOURNAL OF ELECTRICITY, POWER AND GAS of May 1. The following took part in the discussion:

C. W. Burkett, Chief Engineer Pacific Telephone and Telegraph Co., Chairman.

S. J. Lisberger, Engineer of Distribution, Pacific Gas & Electric Co.

S. B. Charters, Department of Electrical Engineering, Leland Stanford Jr. University.

A. J. Bowie, Jr., Consulting Engineer, San Francisco.

A. G. Jones, Sales Engineer, San Francisco office General Electric Co.

F. V. T. Lee, Assistant to President Pacific Gas & Electric Co.

J. W. White, Sales Engineer, Fort Wayne Electric Works, San Francisco.

C. W. Hutton, Engineer of Operation and Maintenance, Great Western Power Co., Sacramento, Cal.

H. W. Crozier, Engineer, San Francisco office of Sanderson & Porter.

C. F. Adams, Assistant Electrical Engineer, Pacific Gas & Electric Co.

S. J. Lisberger: Mr. Jones has given us a very interesting paper on a subject that is of more than ordinary importance. It is to be regretted that the name of the apparatus has been limited to the use of the word "lightning," as one of the most important functions of the electrolyte arrester today is the protection of systems against surges other than those from lightning. I recall a very interesting case in an eastern city, where they had no troubles from lightning—their lines were entirely underground. They have in the circuit I think some 170 miles of cable.

The reactance of the induction regulator in series with the capacity of the cables brought about very serious troubles from surges that in effect seemed to pile up at the end turns of the regulator voltage to such a high extent that it would puncture the regulator windings. This was caused not only by "shorts" in the cable, but "shorts" to ground. They found this condition by taking oscillograph records, and watching results of shorts and grounds artificially produced.

With the hope of finding a solution for the trouble encountered, they put the electrolyte arrester on their system and again observed conditions. They found that great relief was obtained from its use, and, in fact, enough protection afforded by the device in question to actively discharge the high potential from line to ground. A full description and oscillogram curves will be found in the Proceedings of the Association of Edison Illuminating Companies, issue of 1908.

Speaking of the use of this type of arrester as a protection against surges, it would find wiser application were it commercially developed at the present time to be connected directly to the line without the use of an air gap; as any device acting on the safety valve principle, and free from the uncertainties introduced by the air gap, would be a valuable addition to a protective system. The disadvantage of the arrester without the gap is the electrolyte heats, causing the oil to boil over, and renders the apparatus inoperative.

S. B. Charters: In connection with the actual operation of the cell itself, I would like to say, most of my work has been done on a rectifier. Now the first point I wish to make is in regard to the critical voltage. Mr. Jones has stated it to be 420 volts. That is true for the electrolyte he has used, but it will vary widely with different electrolytes. In a number of experiments with five electrolytes, the last had a critical voltage of 65, and the current had risen to ten times the leakage current, and at that time I decided to cut it off. The highest value ran to 594 volts without reaching the critical value of ten times the leakage current. So the critical value you have in such an arrangement is a function of the electrolyte.

The second point I wish to make is the thickness of this film, which does the actual rectifying. The film itself is extremely thin, and forms on the aluminum cells as soon as the current is applied. When the cell is first applied to the circuit there is a rush of current, which lasts until the film builds up. Finally it dies down and reaches a steady value. I found at 110 volts the film thickness was about three wave lengths of sodium light. It would stand safely 110 volts. As he says, that thickness will vary. Starting with a certain voltage, there is a certain thickness of film. As the voltage increases, the film thickness increases with it, and the current drops again. Decreasing from the voltage a similar performance takes place. In the electrolytes there was a continual dissolution of the film in the electrolyte. If the cell on the circuit be operating satisfactorily and then the current be cut off for a while—say 24 hours—there will be a serious dissolving of the film, so when the current is put on again there is a rush of current. I understand that has been overcome in the lightning arrester by the use of a suitable electrolyte.

The action is a molecular one taking place in the film. The critical point can be noted in two ways: By watching the ammeter, and also by the commencement of sparking, showing that the film is no longer able to stand the voltage. On a voltage slightly above the critical value small bits of the film are actually torn away by the stresses. As soon as the voltage falls below the critical value again, those small flaws are repaired.

As Mr. Jones said, if the cell is left on the line, the continual action of the leakage current will gradually heat it; and in the work I did I found between 65 and 75 degrees centigrade the action largely ceases. It recedes as it goes up, and about that point it becomes ineffectual—at least for rectifying work. About that neighborhood the tendency is for the film to become weakened in some way, and gradually to permit the passage of current.

The apparatus is self-restoring as soon as the surge goes off; and aside from the one difficulty of heating it seems to me it is a thoroughly admirable addition to our list of apparatus for lightning protection.

A. J. Bowie Jr.: With reference to the desirability of leaving an electrolytic arrester on the circuit, it appears to me it is undesirable rather than desirable; in other words, it is far better to use the gap in series with it than to allow waste of current, which must ensue on a 60,000 volt line. It was stated a little while ago the leakage was one ampere at 60,000. That would represent on a three-phase line probably 100 kilowatts lost. This is a matter which could hardly be allowed under the circumstances. With reference to the electrolytic arrester, although it has many valuable properties, the fact that it requires attention is rather a serious drawback; and any arrester which needs to be looked after is undesirable in some ways.

Now with regard to the action of Horn arresters. A horn arrester, if incorrectly designed, is certainly not suitable, as difficulty will be experienced in extinguishing the arc. On the other hand, properly designed horn arresters have not shown the difficulties which have been attributed to them; in other words, they don't show the abnormal rise in voltage, and it is not necessary to extinguish the arc in the same half cycle in which it starts. There is no form of lightning apparatus which is so little damaged as the horn arrester. In the multigap arrester if the discharge lasts for much over half a cycle, or continues for some while, a flow of metal will result, which will fuse the cylinders. This does not take place in the horn arrester, and therefore it is not essential to extinguish the current immediately. The experience of many companies, including the Niagara and Ontario, has been very favorable to horn arresters; but the arrester must be

designed with proper resistance. It is one of the essential points of an arrester, however, that there must be a path to ground free from resistance if the arrester is to protect against all kinds of conditions. The horn arrester may be provided with a path direct to ground, in addition to having resistance in certain other paths. This has been done in some cases I have mentioned, and results have been more satisfactory; in fact the resistances seem to withdraw the current from the gaps, which they shunt just as they do in a multi-gap arrester.

A. G. Jones: I would like to say a word about the attention required by arresters. I do not exactly agree with Mr. Bowie in saying that any arrester which requires attention is undesirable. On the other hand, I think it is extremely desirable that lightning arresters, like any other electrical apparatus, should have attention. That is just the cause of the trouble and a great many damaging results, due to the use of multi-gap arresters. The station attendants will put the multigap arresters off in a corner, let them become covered with dust, a little damp air comes along, and under high voltages this dust which is damp is a comparatively good conductor. The results are you have a short circuit the first time you have a discharge. Then the arrester is blamed for its bad behavior; and I do not think that this is just, because a lightning arrester, like any other device, requires attention.

S. J. Lisberger: If the company could protect its system at the expense of a small cost of current, it would be a very valuable addition to the system. That the arrester has some faults in its present state of development, in regard to the attention that must be given to it, is a point which cannot be argued. There is however one great advantage of it over the multi-gap arrester, and that is the varying atmospheric conditions which affect the multi-gap arrester. If you can eliminate dust and dirt and all moisture conditions, as compared to an arrester which is under oil and not affected by those conditions, then you have a very superior type of apparatus.

F. V. T. Lee: The horn arrester has not been fully appreciated by the people in the East. In the early days we tried lots of the multi-gap type out here. The California Gas and Electric Corporation at one time, and their predecessors had to put up buildings sometimes very nearly as large as the station to accommodate the arresters, and after a moderate discharge, even if they did not short circuit it was generally necessary to cut them out to clean up the debris and install new units. At this period we had a great deal of trouble with lightning out here, particularly up in the mountains on the old Nevada County circuits, and many devices were tried to overcome this trouble. The most effective remedy was obtained by increasing the insulation of the apparatus, and since the advent of good insulation the trouble has not been a very real one with us. The horn arrester came in after the non-arcing metal arresters, and filled a long-felt want, and I think have some virtues even today, as the manufacturers of the electrolytic arrester use it in a certain form for their switch. It is not perfect, but it requires a minimum of attention; and while all electrical apparatus should have attention, and plenty of it, at the same time a piece of apparatus that will operate with the minimum amount of attention is the most serviceable one to the operating company. The electrolytic arrester is a very interesting piece of apparatus, but it is still in an experimental stage; and as I believe there is going to be a large installation out here, we will watch its behavior with interest. But I do not think we are ready to dispose of the horn arrester until its successor has been more fully tried out.

A. G. Jones: I want to differ a little bit with Mr. Lee on the question of the experimental stage. I think the aluminum cell arrester is entirely out of the experimental stage, and has been for the last year or more. I do not mean to say that Mr. Lee has this impression, but a good many people have—they think, when you see the lightning discharge coming, that you have to run and set the aluminum cell arrester to catch it. You do not. Some one over in Nevada, I believe it was, said they would not have that kind of arrester around a station, because every time a storm came up you had to watch the arrester, and wait your chance, and catch the discharge when it happened to come in. He got that mistaken impression from the fact that once a week, or every two or three days, the arrester had to be charged; in other words, it had to be periodically looked after. It was a mistaken impression gained from that fact.

J. W. White: I am not acquainted with that person in Nevada, but it is a wonderful country for lightning. At one of our stations we had a multigap lightning arrester. Both Mr. Poole, who was assistant manager, and myself, were afraid to ever connect that lightning arrester in, for the simple reason that I kept a record of one storm at Goldfield, and the lightning went over our horn gaps 24 times in half an hour. Lightning which will discharge over a horn gap set for 40 per cent rise will destroy any multigap arrester in the country. Our line in this particular installation is 3,000 feet elevation at the power station, about 6,000 in Tonopah, 5,000 in Goldfield, and 10,000 going over the White Mountains. One form of lightning is that which is accumulated due to the difference in elevation, and if that condition exists, as it did up there, it would be impossible to use the aluminum arrester with satisfaction, even in the central station, which is the only point where it would be satisfactory in its operation, and it would be necessary to revert back to the horn arrester with resistance and inductive gaps straight to the ground.

A. G. Jones: I don't know. Here is a 12,500, and there are week without any detrimental results, there being, of course, the horn gap in series. This is accomplished by using various kinds of electrolyte. There are two electrolytes. One has a higher resistance, and is the one which is used where it is desired to keep the arrester on the line say seven or eight days without recharging. It is necessary to have just as low a resistance as possible; and where it is easy to look after the arrester every day, the low resistance electrolyte is generally used.

Question: In charging that arrester you connect the top plate directly to the line?

A. G. Jones: No, through a spark gap. You always have a gap there whose length is dependent upon the voltage. In between that gap you put a little wiper, which does not short-circuit the gap, but just shortens it. The charging current of the arrester itself is all the current which passes, and that only for a very few seconds.

Question: Then the leakage, which I understand is about one ampere on the 60,000, is across the air gap?

A. G. Jones: No, I stated 60 *cycles*—not 60,000 volts. I don't know just exactly at what voltage that was taken; but of course the leakage current is dependent upon the capacity, the electrostatic capacity, of the arrester; and of course the varying frequency will vary the amount of leakage, or charging, current. There is absolutely no leakage in service, because you have the horn gaps in series at all times. The leakage spoken of in the first part of the paper is in reference to arresters that are on the line continually, that is, we have made a great many tests, by putting 2,300 volt arresters directly on the line, without any gap whatever, and I have left them on at least two or three weeks without any detrimental results.

Question: On a 60,000 volt circuit, how many plates would you use?

Mr. Jones: I don't know. Here is a 12,500, and there are used twenty-six, so you can calculate from that how many there would be on 60,000 volts.

Question: You spoke something about leakage of the current, and you did not state whether it is uniform from a low voltage up to the critical voltage.

A. G. Jones: You take a bare piece of aluminum and put voltage to it, of course the flow of current will depend on the resistance of the electrolyte.

Question: But after the film is formed, after you have your condenser, does the current gradually increase as the voltage increases up to the critical point?

A. G. Jones: The leakage of the current depends upon the breaking down of the film. I explained it as simply "a leaking

safety valve." I stated in the paper there that at 1,200 volts the current was practically a million times what it was at 600.

S. B. Charters: The leakage of the current reduces down to a certain permanent value. Now as you run your voltage up, that increases, but does not increase in proportion to the voltage, but to a slight extent.

Question: The increase is then due solely to the loss?

S. B. Charters: As far as I know.

S. J. Lisberger: Mr. Bowie, when you stated that the time is half an hour that these condensers stay on the line, do you mean subject to intermittent lightning discharges, or that they are capable of withstanding the heat due to the line voltage?

A. G. Jones: I mean that they will continually discharge abnormal voltage for a period of half an hour or more.

S. J. Lisberger: They would not stay on the line indefinitely?

A. G. Jones: No, they would simply overheat, that is all. The electrolyte would probably evaporate to a certain extent.

C. W. Hutton: It occurs to me, from the general drift of the discussion, that the impression is wrong in regard to the function of the cell. Mr. Lee has told us how nicely the horn arrester has assisted them in some of their work. Now we all know that the horn arrester, if we could set the gap close enough to our working voltage, would protect us absolutely; but if we get a slight rise, and the current follows, the general disturbance to the system is such, and would be so frequent, that we could not tolerate it. The function of the aluminum cell arrester is to act like a safety valve in connection with the horn gap. You can therefore set a horn gap, which gap would allow a discharge to pass across it at a slight increase in voltage. The aluminum cell acts as a check valve, so that when the discharge, which is due to the increase, which may be caused either by lightning or a surge, after it has passed through the cell the function of the aluminum is to choke that off, and as soon as the current has stopped within the minimum value (which is done as soon as the reversal takes place) then your arc is extinguished, and your gap is then set in position to take care of another discharge. As far as the heating is concerned, there would be no heating with this unless there is a discharge going through it, and those discharges will be taken care of as they come along; and while the gap is set in proper position the arrester is always in condition to take a discharge. It can stay there for a week, and there would be no current pass through it at all; and the matter of the attention that is required to be given to the arrester in order to keep the film properly formed, simply means that this gap which is in the circuit would perhaps not allow a discharge going across it every 24 hours. If you could bank on that it would never be necessary to charge it; but inasmuch as you don't get that condition, it is necessary to go there, and in some manner to decrease the length of the gap so that a discharge will take place across there and charge the cells.

Question: If you put up a cell like that, and get that film formed on it, it offers resistance to the current in one direction, but not in the other. An alternating current varies. If the cell offers the resistance to one-half the wave, it will offer none to the other half. It is not a question of lightning discharge now at all, but of voltage. Why will one-half the alternating current shunt the flow right through it when the other half is shut off?

H. W. Crosier: As I understand the electrolytic cell they only have one aluminum plate in each electrolytic cell, but in this case they have two plates. In each particular cell they have two plates, and of course they have a number of plates, and each plate performs the object of being a plate with two different cells, that is, one plate is connected to the line, and eventually there is another plate connected to the ground; but the aluminum film acts as an arrester or stoppage to the current in both cases. Now the connection in the electrolytic rectifier of one of the plates is some other material, and one is aluminum. There are two cells in each rectifier. Now I have got started, I want to make a criticism about this matter, and that is, that something is going to happen—supposing, for instance, the lightning is working along in perfect condition, and some accident happened to the installation, or to the oil, or some of our usual transforming troubles, in my opinion the horns are not big enough. Now we have been working a good deal on the line of horns, and horn switching for high voltages, and most people who have had experience in that line have been offering us horns about 6 or 7 or 10 feet long with the expectation of being 100,000 volt circuits. Now the lightning arresters which are to be used on these same circuits have horns only about 3 feet long. I notice in the samples here they are short horns. Now if the horn is to act in the first place just as a gap, to keep the current zero under ordinary conditions, well and good; but in certain emergencies that horn may have to act to stop a dynamic current due to the failure of the arrester, and I believe in that case the horn ought to be very much longer. I believe that is a point which should be considered a little more than it has been.

Now in the design of the station which is to be built here in San Francisco it has only been considered tentatively at present; we are seriously considering setting all these lightning arresters on the roof as the most convenient place and I presume that will make a rather startling appearance to see a whole lot of these lightning arresters on the roof.

C. F. Adams: There is one form of lightning arrester that I haven't heard discussed this evening that I had something to do with some years ago. That was simply a couple of stands of cast iron about 6 or 8 inches square, with a very moderate air gap, and the plate which led to ground was attached to a tumbrel, screened in a wooden box full of water, that wooden box being mounted on insulators. In other words, it was a heavy slab of cast iron with sufficient liquid resistance in series with it to the ground to absolutely limit the flow of current under any condition of discharge. That arrester was put on a 20,000 volt line, and carried the lightning system through some of the severest storms that Nevada could produce. It was brought up to the attention of manufacturing companies, and I learned that it had a fatal defect—it was not a commercial proposition (laughter).

AN UNUSUAL EXAMPLE OF WELDING.

BY O. S. VANCE.

Although the use of "thermit" for welding steel and wrought iron is becoming fairly well known, it remained for the engineers of the Los Angeles Gas & Electric Company to press into service this wonderful process for repairing a large casting.

In the electric-generating station of the company a break-down recently occurred in a 12x12 inch vertical Shepherd engine driving a centrifugal pump for the condenser of one of the large turbine units. While the accident caused no interruption in service, it put the condenser out of commission and rendered the operation of the turbine unit impracticable until the broken part could be repaired or a new one substituted. The break existed in one of the two cast-iron members which constituted the main frame of the engine, parting at a point close to the cylinder where a crack had been noticed for some time previous. As the broken member was quite complicated in form it could not be used as a pattern in casting another; while to make a pattern and cast, machine and fit a new part, or to wait until a duplicate casting could be obtained from the engine builders, would mean considerable delay and expense. The superintendent of the station, who had had some experience with the use of thermit in welding steel and wrought iron, believed that if properly handled the broken casting could be saved by the use of the agent, and with the assistance of a couple of railroad mechanics who were familiar with the thermit process in welding steel locomotive frames, but were reluctant to attempt it with cast iron, undertook the job.

To repair the engine frame in question required but twenty-two hours, including the time necessary to collect the various materials, the preparation (including the drying out and thorough heating) of the molds, and running in the thermit; and the entire cost was but nominal.

A NEW MANAGER.

The Western Electric Company announces the appointment of Mr. T. E. Burger to the position of manager of their Los Angeles house, the California Electric Company, succeeding Mr. Richard Spencer, who severed his connection with that company some months ago.

Mr. Spencer took up electrical work on the Pacific Coast

RICHARD SPENCER
Former Manager California Electric Company

in 1903 at Seattle at which point he had charge of the Northwest business of the John R. Cole Company of San Francisco. On the opening of an office in Los Angeles by that company in 1904 he was transferred to that point and continued in charge for three or four months, after which he accepted the management of the Los Angeles office of the Western Electric Company.

T. E. BURGER
Manager California Electric Company

In October, 1905, the Western Electric Company purchased the supply business of the Machinery & Electrical Company at Los Angeles and entered the supply field under the name of the California Electric Company with Mr. Spencer as manager. In March, 1908, Mr. Spencer was compelled by ill health to discontinue work and since then has been located at Dansville, New York, where his many friends will be glad to know that he is on the road to full recovery.

Mr. Burger joined the force of the Western Electric Company at Los Angeles in 1906 as salesman and through unusual executive ability and natural adaptability to sales work was advanced to the position of assistant manager, a position he held at the time of Mr. Spencer's retirement. His recent advancement is a well earned recognition of conscientious and faithful work.

GENERAL ELECTRIC TEAM WINS AT BASEBALL.

On Saturday, April 24th, a picked team of ball players from the General Electric Company, under the management of Frank D. Fagan, defeated the "All San Francisco" nine made up of players from the other electrical houses, managed by Milo E. Hicks.

The line-up of the teams and the score was as follows:

GENERAL ELECTRIC COMPANY.

	1	2	3	4	5	6	7	8	9
Spaulding, 1b	1	1	0	0	0	0	0	1	0
Wheeler, l.f.	1	1	0	0	0	0	0	0	0
Lottridge, c.	1	0	0	0	0	0	0	0	0
Carden, s.s.	0	0	0	0	0	0	0	0	0
Crosthwaite, p.	1	0	0	0	0	0	1	0	0
Hunt, 3b	0	0	0	0	0	0	0	0	0
Jones, c.f.	0	0	0	0	0	0	0	0	0
Laingor, 2b	0	0	0	0	0	0	0	0	0
Winchell, r.f.	0	0	0	0	0	0	0	0	0

"ALL SAN FRANCISCO."

	1	2	3	4	5	6	7	8	9
Kahn, 3b	0	0	0	0	0	0	0	0	1
Jones, s.s.	0	0	0	0	0	0	0	0	0
Drendell, r.f.	0	0	0	0	0	1	0	0	1
Ehrenfort, l.f.	0	1	0	0	0	0	0	0	0
Prince, 1b	0	0	0	0	0	0	0	0	0
Loughborough, 2b	0	0	0	0	0	0	0	0	0
Branch, c.f.	0	0	0	0	0	0	0	0	0
Marcus, c.	0	0	0	0	0	0	0	1	0
Hickox, p.	0	0	0	0	0	0	0	1	0

SCORE BY INNINGS:

	1	2	3	4	5	6	7	8	9	
General Electric Company	4	2	0	0	0	0	1	1	0	—8
All San Francisco	0	1	0	0	0	1	2	0	3	—7

A return match has been arranged for at an early date, when the "All San Francisco" team hope to obtain their revenge.

GOVERNMENT TELEPHONY.

The Saskatchewan Government has finally purchased the system of the Bell Telephone Company in that province. The price paid was $367,000 in cash and there is yet due the province some $10,000 in unearned rentals. The system consists of 469.4 miles of long-distance lines with 13 exchanges. The transfer will be made at midnight, April 30-May 1. This was the last mileage the Bell Company owned in Canada between the Great Lakes and the Pacific Coast, and press dispatches state the Ontario Government will shortly consider the purchase of the company's system in that province.

A COMPTROLLER FOR THE PACIFIC LIGHT & POWER CO.

A. W. Kemp, recently cashier with N. W. Halsey & Company, bankers, of San Francisco, has been selected as the comptroller for the entire system of the Pacific Light & Power Company, with headquarters at Los Angeles.

This change on the part of the Pacific Light & Power Company, in connection with their recent sale of $1,000,000 worth of bonds, is of considerable significance and an indication of some important developments in the near future.

Train dispatching by telephone is being substituted for the telegraph on the main lines of the Illinois Central Railroad.

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The Telephone Receiver

The evolution and expansion of the modern telephone system is undoubtedly one of the marvels of recent times. A generation ago little credence would have been given to a prophecy that within a few years any mechanical means of voice transmission could have become so intimately associated or intertwined with business and social relations that its suspension, even for a short time, might result in widespread hardship as well as pecuniary loss, yet, not the least exaggeration attaches to such a view, as evidenced by the recent Paris strike of telephone and telegraph employes.

The fact is the public is becoming more and more dependent on time saving appliances, and among these the telephone is pre-eminently representative. Few people, not barring the electrical fraternity, ever think of the telephone other than from an economic or commercial standpoint. Nevertheless, mechanically, the subject is one of fascination.

The soul of the system naturally lies in the receiver, without which no practical results would be possible. This instrument is simplicity itself. Composed, as it is, of only three essential elements—a permanent magnet, a coil of fine wire and a thin iron diaphragm, the little device has resisted displacement or substitution in face of the combined scientific and inventive forces of the world. Its sensitiveness is almost beyond conception, an ordinary receiver, according to Preece, being affected by a current as infinitesimal as six hundred quadrillionths (000,000,000,000,600) of one ampere. To put it graphically, a string of hand phones reaching, end to end, six thousand times around the earth, or over one and a half times the distance from the earth to the sun would respond to the amount of current required by an incandescent lamp of 32 candle-power. The astonishment created by these figures may even be increased when it is considered that recent wireless telephone receivers are even more sensitive.

When talked into, directly, the receiver absorbing energy from the voice becomes in effect a diminutive, though actual dynamo; and with its diaphragm vibrating in front of the permanent magnet surrounded by coiled wire, induces in this wire its tiny electrical load, of which the line wire forms a part of the circuit.

Originally, the telephone receiver, owing to its reversible qualities, was used both for transmitting and receiving, but the demand for increased loudness and more distant transmission long ago relegated it to duty in the latter role, although its usefulness is not confined to voice reproduction alone. Many instruments for delicate electrical measurements have recourse to the sensitiveness of the receiver and a large field for it has recently been opened in wireless telegraphy.

It is remarkable, that while great strides have been made in other departments of telephony, notably in transmission, line construction and switchboard operation, the unpretentious bit of apparatus in question has suffered no fundamental change since its first appearance.

CURRENT COMMENT

A tax on poles, other than trolley, is being considered by the Board of Supervisors of San Francisco.

Telephone lines in Saskatchewan were taken over by the government on May 1, as all long-distance lines, local exchanges and equipment have been purchased from the Bell Telephone Company.

Japanese government telephone exchanges are 206 in number of which 122 were installed in 1908, including Formosa, Korea and Manchuria. Any place is provided with a telephone upon application.

A telegraphic block system for the operation of all railway trains will be compulsory if a bill introduced in Congress by Representative Hardwick be passed.

The Corporation Commission of Oklahoma has ordered the Atchison, Topeka & Santa Fe Railway to have a telephone at its railway station in Skedee on the ground that the telephone is a necessary convenience.

The Cleveland Industrial Exposition will be held June 7 to 19, 1909, under the auspices of the Chamber of Commerce of Cleveland, Ohio. Many representative electrical manufacturing firms are among the exhibitors.

"Pupin" is the suggested unit to replace "miles of standard cable" which causes considerable confusion for those dealing with telephone transmission phenomena. The Post Office Electrical Engineers' Journal of London is responsible for the suggestion.

Telephones in National Forests are one of the chief factors in minimizing fires. $600,000 is spent annually in building roads, trails and telephone lines to facilitate communication. In many districts telephone lines have been built between the supervisors' office and ranger headquarters and to prominent peaks which are used as lookout stations to observe fires.

Fuel oil has increased the steaming radius of a war vessel 4000 miles and eliminates the chances of detection because of more perfect combustion. Oil is 60 per cent cheaper than equivalent coal on the Pacific Coast and is taken on board much more easily. Such is the result of a six months' trial on the monitor Cheyenne which has recently returned to the Mare Island Navy Yard. This trial forms the basis of a recommendation to the Navy Department that oil burners be installed on all war vessels.

The Teishinsho wireless telegraph in Japan, which differs from the Marconi and De Forrest systems, is used on nearly all Japanese steamships on foreign lines. In the navy all ships, from battleships down to torpedo-boat destroyers, are equipped with wireless telegraphy, and the wireless telephone was successfuly used at the grand naval review off Kobe last autumn. The wireless telephone is being studied in the communication department and in the navy. Wireless seashore offices are at Chasi, Kadoshima, Ochiishi, Osozski and Ushiozski.

PERSONALS.

J. T. Carper, president of the Denver and Colorado Securities Company, and J. J. Abbott of Denver are visiting some of the California power plants.

G. E. Pingree of the New York office of the Western Electric Company, reached San Francisco on May 3d on a return trip from China where he has spent about six months on special work of interest to his company.

T. E. Bibbins, assistant manager on the Pacific Coast of the General Electric Company left on May 4th for the East where he will attend the annual conference of managers of his company at Schenectady, N. Y.

James A. Anderson, who has been connected for some time with the Electric Railway and Manufacturers' Supply Company of San Francisco, left for Chicago on April 30th, where he has accepted a position with the American Safety Paper Company.

F. L. Pierce, treasurer of the Cutler Hammer Manufacing Company, Milwaukee, Wis., spent several days of last week in San Francisco after a brief vacation in Southern California. He will continue his coast trip through the Northwest, returning East from Seattle and Spokane.

W. B. Potter, engineer of the railway department of the General Electric Company, is now fully recovered from his recent illness and operation, due to unusual effort and fatigue incurred during his long trip over the Pacific Slope, investigating power and traction conditions there. Mr. Potter has been under private treatment in New York City, but is now convalescent and resuming work, much to the pleasure of a host of friends.

TRADE CATALOGUES.

The Western Electric Company illustrate and describe Telephone Aims for office service in a neat folder.

Bulletin No. 112, issued by the Crocker-Wheeler Company, Ampere, N. J., on Exhaust Fans shows the variety of service to which these fans have been adapted.

The monthly Bulletin from the Ohio Brass Company of Mansfield, Ohio, contains a brief description of the Oregon Electric Railway System, in addition to the usual news and anecdotes.

Jandus Fans are handsomely portrayed in Bulletin No. 35 from the Standard Electrical Works, San Francisco, Cal. These fans are made for both direct and alternating current for all kinds of service.

Salesman's Information comprises an interesting series of questions and answers regarding the Couch & Seeley Co. "Ideal" Automatic Button Switch Inter-communicating Telephone, for which the Standard Electrical Works are San Francisco agents.

Widely differing machines are driven by large direct current Crocker-Wheeler motors as described in Bulletin 113 issued by the Crocker-Wheeler Company, Ampere N. J. These motors are used on lathes, hoists, bloom shears, big rolls, and ammonia compressors. Important features of construction are clearly explained and are illustrated with photographs that will give details of construction, and others showing the motors installed for service.

Booklet No. 3770, issued by the General Electric Company, describes a Telephone Line Insulating Transformer. The purpose of this apparatus is to safeguard the users of telephones from the dangers of high voltage due either to induction or accidental contact between telephone and power lines and to improve the telephone service by removing the ordinary small ground gap carbon arrester from direct connection with the line, as well as providing ample insulation between the interior wiring, instrument, batteries, etc., and the line.

THE JOBBERS PLAY GOLF AT DEL MONTE.

T. E. BIBBINS
Winner of the Del Monte Cup, P. J. Aaron of Seattle in the background

THE SECOND Golf Tournament of the Electrical Jobbers' Association of the Pacific Coast was held at Del Monte, California, on April 24th and 25th and the much-coveted Del Monte cup was won by T. E. Bibbins of the General Electric Company, San Francisco. The former winner, W. L. Goodwin of San Francisco, made a gallant struggle to retain it, but was nosed out by a paltry 18 strokes—only one stroke a hole—which indicates how close a match it was.

The weather was all that could be desired and the course was in perfect condition. Play started at 10 o'clock on the morning of the 24th, 16 members taking part, the handicaps being based on the results of the match of January 17th, 1909. Following is the score:

	Actual Strokes.	Handicap.	Net.
Bibbins, T. E.	122	60	62
Goodwin, W. L.	112	32	80
Knoche, G. A.	150	67	83
Woodward, F. H.	146	59	87
Davis, R. J.	97	6	91
Holabird, R. D.	101	9	92
Scribner, E. M.	114	22	92
Hillis, C. C.	162	59	103
Brown, W. S.	163	60	103
Elliott, A. H.	149	44	105
Berry, W. S.	131	20	111
Carrigan, Andrew	125	6	119
Carter, H. V.	182	60	122
Burger, T. E.	152	30	122
Kuhn, Robert	159	30	129
Gilson, C. L.	190	53	137

The conclusion of the principal match found 15 of the participants with an ambition still ungratified and it was decided to give them another opportunity. A second match was arranged for the morning of the 25th, the 16 players being divided into two divisions, the first and second eight, and each eight played an eighteen hole match for a box of golf balls.

The prize in the first eight was won by F. H. Woodward, and in the second eight by G. A. Knoche. Mr. Bibbins, who won the cup on the previous day, played this match out, but generously refrained from winning, his courtesy being greatly appreciated by the others.

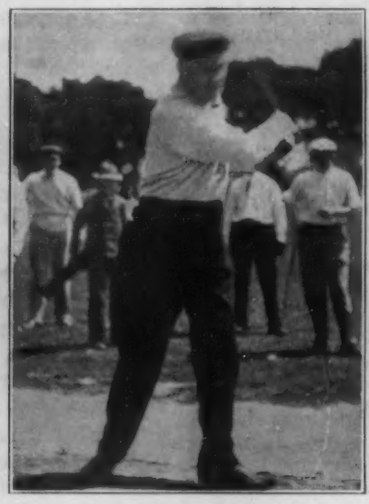
On the night of the 24th an elaborate dinner was tendered to the winner at the Hotel Del Monte, at which 30 members and guests were seated. The number included Robert Kuhn of the American Electrical Heating Company, Detroit; H. B. Vanzvoll, secretary of the Sunbeam Incandescent Lamp Company, Chicago; Wm. Coale of the Sterling Electric Manufacturing Company, Warren, O., and E. M. Latham, purchasing agent of the Pacific Light & Power Company, Los Angeles.

At the conclusion of the dinner the trophy was filled and started on its rounds, each man, as he quaffed, responding to the toast to the winner and wishing better luck at the next meeting to the losers.

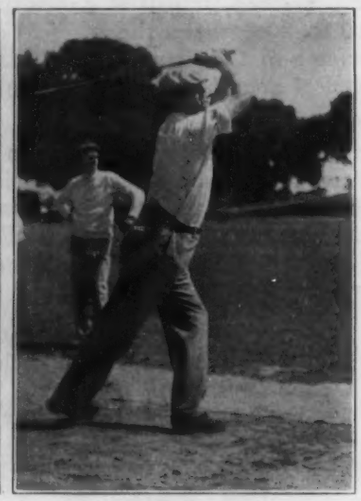
The dinner was ably managed by Andrew Carrigan as toastmaster, assisted by R. D. Holabird.

Incidental to the golf tournament several business meetings were held, conveniently arranged at such times that they would not conflict with the game. They were of a purely routine nature and the only business of importance transacted was the appointment of a permanent golf committee, consisting of Andrew Carrigan, R. D. Holabird, W. L. Goodwin and E. M. Scribner.

W. S. BERRY
The beginning of a left hand drive



W. L. GOODWIN
The "loser" of the cup



ANDREW CARRIGAN
Finishing a remarkable iron shot

It is interesting to compare the scores made at the match of January 17th with those of April 24th, and the following figures will give some idea of the uncertainty of the game:

	Actual Strokes.		Net.	
	Jan. 17.	Apr. 24.	Jan 17.	Apr. 24
Bibbins, T. E.	160	122	133	62
Goodwin, W. L.	132	112	87	80
Knoche, G. A.	167	150	113	83
Woodward, F. H.	159	146	105	87
Davis, R. J.	106	97	110	91
Holabird, R. D.	109	101	105	92
Scribner, E. M.	122	114	112	92
Hillis, C. C.	159	162	105	103
Brown, W. S.		163	...	103
Elliott, A. H.	144	149	90	105
Berry, W. S.	120	131	105	111
Carrigan, Andrew	106	125	110	119
Carter, H. V.		182	...	122
Burger, T. E.		152	...	122
Kuhn, Robert		159	...	129
Gilson, C. L.	153	190	99	137

The bogie on the course is 73.

The next tournament will be held at Seattle in June.

An exciting 9 hole foursome was played on the afternoon of April 25th, between R. J. Davis, Andrew Carrigan, R. D. Holabird and E. M. Scribner for a ball a corner, Mr. Carrigan winning the match by one stroke over Mr. Scribner.

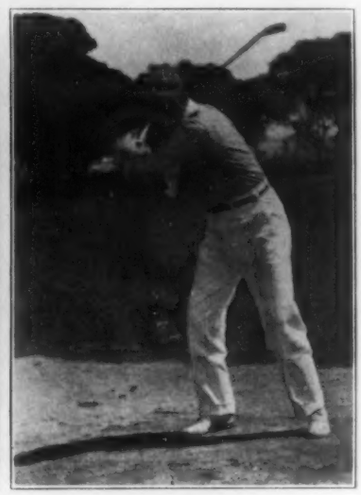
When A. H. Elliott and C. C. Hillis were about to drive off the seventh tee, Fobes of Seattle bet Fowden of San Francisco 8 bits that Elliott would drive into the woods on the left and Hillis would drive into the woods on the right. Fobes won.

G. A. Knoche threw his club on the first drive, the club landing ten yards beyond the ball and he claimed the right to play the ball from the point where the club lay. It was necessary to call in the Golf Committee to decide the point, which was against Knoche.

W. S. Brown was the only member of the Seattle delegation who entered the tournament but through lack of sleep was unable to keep more than one eye on the ball at a time. With a little more practice and a great deal more sleep Mr. Brown should have no difficulty in landing in the first division.

R. D. HOLABIRD
The cup winner, Mr. Bibbins is on the left

G. A. KNOCHE
Remarkable position at the finish of a "clubless" drive



E. M. SCRIBNER
An example of perfect golf form

NOTES OF THE GOLF GAME.

Andrew Carrigan was unfortunate in his drive from the second tee, the ball landing in the high grass, costing him 18 strokes.

R. D. Holabird was the symbol of purity, being dressed entirely in white, and played with a white ball. He was the most handsomely gowned man on the course.

Mrs. Andrew Carrigan, Mrs. W. S. Berry and Mrs. Wm. Coale of Warren, O., were interested members of the "gallery" and offered first aid to the injured on several occasions.

G. A. Knoche was as unfortunate at pool as he was at golf. In a game with R. D. Holabird he succeeded in pocketing only two balls and was compelled to spot half of them as a result of an unfortunate scratch.

NOTABLE SWITCHBOARD ORDER.

The new "Wade" exchange for the Cuyahoga Telephone Company at Cleveland, Ohio, has just been ordered of the Dean Electric Company. This is the largest single contract placed by an independent operator since the Detroit Home Telephone Company ordered their mammoth equipment of the same manufacturer.

The exchange consists of ten common battery multiple sections with four additional sections comprising a "B" board. A capacity of 3240 lines is to be installed for immediate service with an ultimate capacity and present equipment of 6,400 lines.

The order includes complete power and terminal facilities, as well as the necessary apparatus for Dean Harmonic selective party line service. The new exchange will relieve the over-load on the "Central" and "Crest" exchanges of the Cuyahoga Telephone Company.

INDUSTRIAL

INTERCOMMUNICATING TELEPHONES.

The increasing demand for intercommunicating telephone service throughout the country has induced the Western Electric Company, the largest manufacturers of telephones in the world, supplying all the equipment used by the entire Bell system, to place on the market, two types of metal automatic intercommunicating telephone equipment. These sets

Fig. 1.

are made in two types, a non-flush set for mounting on a wall, and a flush set for mounting in a wall. All apparatus is compactly mounted in a fire-proof iron case, having a hard, durable, black japanned finish with nickel trimmings. Owing to the attractive appearance of this set, it is in keeping with the furnishings of any room.

Fig. 2.

The non-flush wall set has all the telephone apparatus mounted on a door, which is hinged at the bottom so it can be swung down as in Figure 2. To make the apparatus accessible for maintenance and inspection, all current carrying parts, including the transmitter, are insulated from the case, and a concealed binding post receiver is used. A special feature of this set is the dust-proof side used in connection with the switch hook to prevent dust from entering the case through the switch hook slot.

The flush wall set, Figures 3 and 4, possesses all the features of the non-flush type, and in addition, the front of the set is removable from the back, this permitting the back of the set to be used as an outlet box. This set may be placed

Fig. 3.

in a residence or building while the building is under construction, or in an old building before the wiring is started, and the front of the set containing all the working parts, fastened in place when convenient. The advantages of this feature will appeal to contractors, and those installing sets in old or new buildings.

Fig. 4.

The superintendent's call equipment can be furnished for any of the stations, to enable a general call being given throughout the system for the superintendent, who may be in one or another of the departments.

Either full metallic or common return wiring may be used to connect the stations together. The former ren-

ders the system less subject to inductive disturbances and cross talk, and this is to be recommended especially if the system is to be connected to an exchange or outside service. If the maximum distance between any two stations is 500 feet or less, the ringing battery should have a potential of about 4 volts, and the talking battery about 4 volts. With 1200 feet as a maximum distance, potential of the ringing battery should be 5 volts, and of the talking battery 4 volts. With 2,000 feet as the maximum distance the ringing battery should have a potential of 7 volts, and the talking battery of 6 volts.

These sets have a capacity of 12 stations, each set being provided with 12 buttons, one button for each station, and the name plate is provided with space opposite each button for designating the name or location of the station associated with the button. The same button is used both for signalling the station desired, and for establishing telephone connection.

EDWARDS' ANNUNCIATORS.

A new style of annunciator has been placed on the market by Edwards & Co. of New York City through the Western Electric Company as distributing agents. The annunciator is of the lock gravity drop type and is especially designed for ease of installation at minimum cost. The back

Edwards' Annunciator, Showing Mechanism.

board containing all the drops, connectors and bell is first fastened to the wall and the connections and tests made. The covering case is then easily and quickly fitted by means of brass hooks, requiring no screws or tools. In the same way it can be taken off at once without tools should it be necessary to inspect or change the tags.

The connectors are at the bottom of the back-board where most accessible and require no solder. The case is of selected oak, neatly designed and finished. It completely

Edwards' Annunciator, Complete.

covers the Eco bell which is mounted on top of the back-board, thus eliminating clogging by dust. The restorer is conveniently placed at the bottom and the gravity drops give large, clear indications that can be cheaply replaced. The whole device is claimed the best and at the same time one of the lowest priced on the market.

MULTILETS.

An improved stamped steel knockout box has been placed on the market by the well known conduit manufacturer, the Sprague Electric Company. This box is called Multilet because that name practically tells the whole story—one box with many uses. It is made in two sizes with a set of covers

Fig. 1.

Fig. 2.

for each size. This combination apparently meets all requirements and greatly simplifies the stock problem for the jobber and contractor, and also for the wireman whose work need not be delayed while he is hunting for some particular fitting. With the Multilets, no special fittings are required for special work, and, hence, there need be no expensive

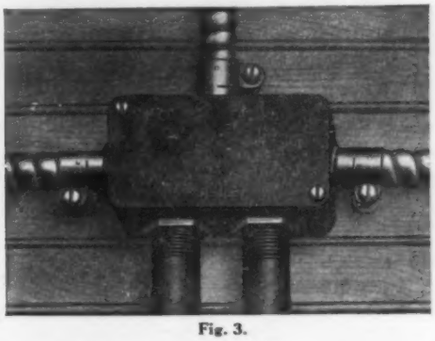


Fig. 3.

delays. The Multilets also ensure a uniform and safe installation.

The Multilet box, shown in Figure 1, has six oulets, one in each end, one in the bottom, two in one side and one in the other. The box and covers, except those that are porcelain, may be obtained in either galvanized or enameled

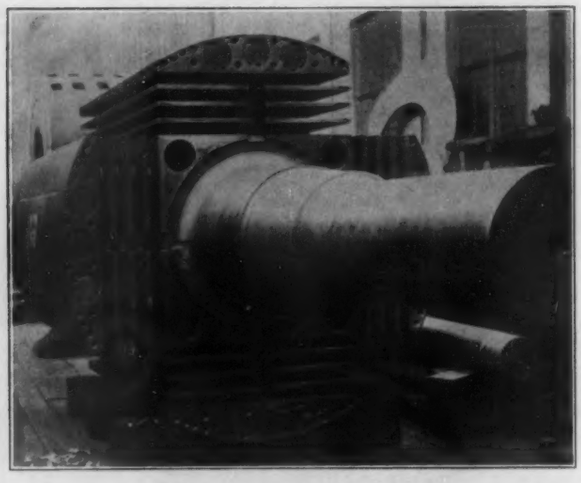
Fig. 4.

finish. The box occupies little space yet affords plenty of room inside for the wires. It accommodates standard fittings, such as rosettes, receptacles, snap switches, etc.

Several types of covers are shown in Figures 2, 3 and 4, and a full line of them will be found in Catalogue No. 424 a copy of which may be obtained by addressing the company at San Francisco or Seattle.

WESTINGHOUSE GENERATOR FOR CITY ELECTRIC COMPANY.

The accompanying illustration shows the rotating field of the 15,000 k. w. turbo-generating set that is being installed by the Westinghouse Electric & Manufacturing Company in the



Rotating Field of 15,000 h. p. Turbine Generator Set for City Electric Company.

North Beach plant of the City Electric Company of San Francisco. The photograph was taken in the shops before shipment. The length of the rotating field at its shaft is 17 feet 10 inches and the weight 60,000 pounds.

VULCAN ELECTROCURL.

The Vulcan Electric Heating Company of Chicago, who have for some time past manufactured electric curling irons, marketed by the Del Sales Company of Chicago, announce the discontinuance of their selling arrangement with that company and their policy to handle their product with the trade direct in future.

This device will be marketed by them under the name of the Vulcan Electrocurl No. 5100, the list price established being $3 each.

Vulcan Electrocurl

The manufacturers' claims for the Electrocurl are that it is elegantly finished, strongly made, has a dependable heating element, convenient cord connector and an improved durable cord fastening. It is thoroughly reliable and practical and makes a handsome present. At 10 cents per k. w. it costs but 1-3 cent per hour to operate. It maintains a constant heat generated from within and in its cleanliness, convenience and safety is superior to any other means for the purpose. It is a luxury which will undoubtedly become a necessity in the near future.

IMPORTANT DEVELOPMENTS IN BITUMINOUS GAS PRODUCERS.

For a number of years the Westinghouse Machine Company has been engaged in the development of a satisfactory form of producer suitable for gasifying the usual grades of bituminous fuels. The unusual difficulties encountered in the utilization of this kind of fuel have resulted in the trying out of many differnt types, both of the producer itself and of the necessary auxiliaries for producing clean gas. For the past year and a half, however, the company has been engaged in carrying out upon a commercial scale, a producer plant which is now upon the market. These tests have not been conducted with a toy apparatus, but with a full-sized equipment of 175 horsepower, including a standard gas engine of about the same power, by means of which the actual power value of the gas produced and the overall efficiency obtainable, were determined without possibility of error.

The above-mentioned tests were brought to a conclusion on April 3d, by drawing the fire in the producer after it had been in continuous operation on various loads and on various fuels for a year past, these twelve months having been devoted to tests of one to four weeks' duration, both ten and twenty-four hours per day on standard fuels available for power purposes. These fuels included Pittsburg slack and run-of-mine, lignites from northern Colorado, Texas and South America, also peat and other fuels from various parts of the country. Most of the tests the load on the equipment was maintained at full rating, although one special test of one month and a half duration was made to determine accurately the standby loss of the producer standing idle.

The drawing of this fire after one year's operation was made the occasion of a demonstration of the producer plant before government officials and engineers from various parts of the country especially interested in bituminous gas practice.

The fire was drawn without trouble or interruption as large clinker formations were entirely absent, although the producer had, just previous to this occasion, been running on a full-load test for one month, using Pittsburg coal. The lining of the producer was found to be practically intact and in quite good enough condition for continued operation for an unlimited period.

A detailed examination of the piping leading from the producer house to the engine on test, showed that during this long period of operation, there had been no deposits of tar or lampblack. As a matter of fact, this piping had not been examined for about two years and a half of producer experimentation.

The most important feature of the demonstration was the entire absence of tar formed in the producer gas. A similar examination of the mixing and inlet valves of the engine which has been used for the past year on this test, showed practically no deposits of tar or lampblack, such as would interfere with the operation of the engine. The Westinghouse plant uses no tar extractors, as no tar is made, simply a static washer of small size in the place of the usual bulky coke scrubber. A rotary exhauster draws the gas from the fuel bed and delivers it to the engine at a definite pressure.

No gas holder is used in this process, as the producer regulation is entirely automatic. The gas produced has a moderate heat value suitable for high compressions in the gas engine, and is uniform and clean, average samples showing not more than .02 to .03 grains per cubic foot impurities.

The ash is fairly clean, and analysis of samples from time to time shows that not more than 1% to 3% of the combustible in the coal escapes in the ash.

The various fuels which have been used in this producer on test, have been gasified successfully, and have run as high as 34% moisture, 35% volatile and 15% ash and 1½% sulphur. The results of the tests show that with coal, such as Pittsburg slack or run-of-mine, an overall economy of 1.1 pounds per brake horsepower hour can be secured, equivalent to a little over 9/10 pounds per indicated horsepower hour. Moreover, the producer efficiency does not vary more than 10% from full load on the plant to no load.

The results of this past year's tests have fully convinced the builders that the apparatus experimented with possesses unusual commercial value, and preparations are being made for extensive manufacture. A plant of this type has been in operation for over six months on Colorado lignite coal with equal success, as evidenced by an order recently placed with the Westinghouse Machine Company for duplicate shipment.

DEAN TOLL SWITCHBOARD.

The Lincoln Telephone Company of Lincoln, Nebraska, has just ordered a six section toll switchboard from the Dean Electric Company. The contract includes complete terminal, power and telegraphing facilities. The development of telegraph service in connection with long distance telephone work, has been given special attention by Dean engineers. The contract includes a two position Chief Operator's desk, a two position Wire Chief's test board, main and intermediate distributing frames, battery racks, repeating tables, and power plant complete. The exchange is equipped for sixty lines, with an ultimate capacity of well over that number. Service is provided by lamp signal bridged multiple equipment. By this method all series contacts in the talking circuit are eliminated. Service is handled through a complete and solid metallic circuit free from any complications whatsoever.

NEWS OF THE STATIONARY ENGINEERS.

Cal. No. 3, National Ass'n of Stationary Engineers, held a regular session on Wednesday evening, April 28, and an unusually interesting meeting took place, many questions of interest to the practical engineer being discussed. Mr. H. D. Saville, president of the State Association, reported having visited, in company with Mr. Chas. L. Turner, San Jose Association No. 6, on Wednesday, April 21, and expressed himself as being much gratified at the progress in association affairs in San Jose. The members there announced that the San Jose contingent of members and families, together with a number of the San Jose men of affairs purposed chartering a special train to convey them in a body to the State Convention which takes place in San Francisco in June. The State President also stated that before the convention took place he hoped to announce the formation of new associations in Sacramento and Santa Cruz.

Los Angeles No. 2 held an election on April 30th for delegates to the convention to be held in San Francisco, June 14-19, and eighteen were elected, with the same number of alternates, who, as their wives will accompany them, will make a pretty respectable showing from the South.

Los Angeles members are looking forward with much interest to a promised lecture by Bro. T. S. Thomson, Chief Engineer of the Los Angeles Gas & Electric Company's electric station, on the subject of "Steam Turbine Practice," which will be much appreciated by the members. It has been promised for May 21st.

National President Fischer and State Secretary Curl have been invited to go to Santa Barbara and pay No. 5 a visit and meet the leading business men of that city, around the festal board, and May 8th has been decided on for the trip. A very enjoyable time is expected, as the members of No. 5 are "on the job" when it comes to entertaining, to which all those who attended the State Convention there in 1905 can testify.

ENGINEER MISSING.

Chas. L. Brandon, a member of Cal. Ass'n. No. 3, N. A. S. E., has been missing since last September and his friends and relatives are greatly concerned regarding his mysterious absence. Mr. Brandon was last heard of in Spokane, where he was on the lookout for a position, having just left the position of master mechanic at the British Columbia Copper Company, Greenwood, B. C. Mr. Brandon was about 30 years of age, 5 feet 10½ inches in height, and weighed when well, about 160 pounds; had dark hair, eyes and complexion. Was smooth shaven when last seen. Any information concerning Mr. Brandon will be gratefully received and forwarded to his wife by David Thomas, Secretary California No. 3, N. A. S. E., 914 O'Farrell Street, San Francisco, Cal.

TRADE NOTES.

The Parker-Clark Electric Company, with which Company Mr. Walter G. Clark, formerly with the Kilbourne-Clark Company, Seattle, is associated, announce their removal on May 1st to their new offices in the Singer Building Tower, 149 Broadway, New York.

The Pelton Water Wheel Company supplied the four 5000-horsepower Francis turbines used in the Schaghticoke hydro-electric station which generates electrical energy for the General Electric Schnectady works. The Pelton Company also supplied the speed governors.

The Willapa Harbor Telephone Company of South Bend, Washington, has contracted with the Kellogg Switchboard & Supply Company for complete common battery office equipment and telephones for South Bend, and for complete telephone equipment for Raymond, Washington, to operate in connection with its present switchboard.

The new White House of San Francisco was opened for business Saturday evening, March 13th. It is lighted by multiple glower Westinghouse Nernst lamps in ornamental fixtures. The total installation consists of 1,000 glower units. This is one of the finest stores in the rebuilt down-town district. The opening was attended by no less than 75,000 people.

Dossert & Co., of New York, report the receipt of the following large orders during the current week: 2,500 flat shank solderless lugs and 1,500 3-way connectors from the Edison Electric Illuminating Company of Brooklyn; 300 3-way connectors for shipment to South Africa; 100 cable taps and 3-way from the Mengel Box Company of Louisville, Ky., a large number of insulated 2-way joints from the Wagner Electric Manufacturing Company, of St. Louis, Mo., and a number of special termina's for use in the equipment of electric furnaces in the Niagara Falls plant of the American Cyanide Company.

The Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., announces that it has received a contract from the Falkenau Electrical Construction Company of Chicago, engineers for the Salt Lake & Ogden Railway Company, covering direct suspension line material for the thirty-seven miles of electrification of the present steam road between Salt Lake City and Ogden.

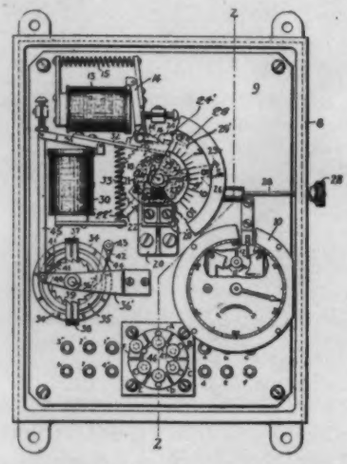
In the same connection, a contract has been closed covering the line material for the Gallatin Valley Electrical Railway Company, of Bozeman, Mont., for eighteen miles of new line; and an order has also been entered from the Long Island Railroad, covering twelve miles of low-voltage catenary construction.

The Kellogg Switchboard and Supply Company of Chicago have just closed a contract, through their San Francisco branch, with the Prescott Electric Company of Prescott, Ariz., for equipping their exchange with a new two-section multiple harmonic switchboard. This board will have 520 lines equipped and will be complete with power plant and distributing frame. The Kellogg 4-party harmonic telephone will be used.

The Kellogg Switchboard and Supply Company have also closed a contract with the Montana Star Telephone Company, Culbertson, Montana, for a 200-line express type switchboard with 100 lines equipped, which apparatus is now being installed.

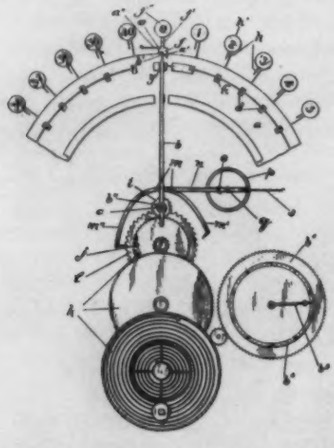
PATENTS

918,848. Signal System. John L. Hall, Schenectady, N. Y., assignor to General Electric Company. In a signal system, the combination of a transmitter, a receiver arranged to respond thereto, a time mechanism in the transmitter, a movable contact operated thereby, a spring to retract the



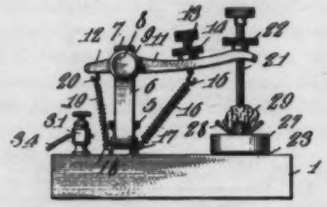
movable contact when released, a contact adapted to be engaged by the movable contact, means for adjusting the same, and means controlled by said contacts for releasing said movable contact and for causing the receiver to give its indications.

918,955. Telephone System. Charles F. Bradburn, Delmer, Ontario, Canada. In a telephone system, a selecting apparatus consisting of a primary dial having a series of contact plates arranged in an annular formation one of which is employed as the initial contact plate, a primary pointer revolvable on the primary dial and arranged to successively



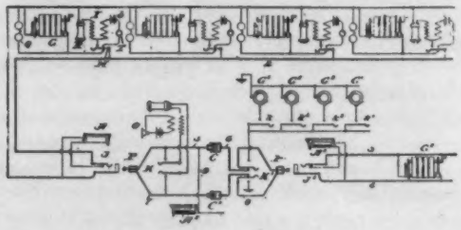
engage the contact plates, a detent stop to hold the primary pointer at its initial position and normally set in the path of the primary pointer, an arresting stop for each of the other contact plates normally clear of the path of the primary pointer and adapted to be set in the path of the latter, and an actuating spring to return the detent stop to hold it in its operative position.

918,618. Wireless Telegraph Receiver. Wesley M. Way, Austin, Tex., assignor to George W. Trommlitz, Galveston, Tex. An electric wave detector comprising a cup or holder for a suitable crystalline mass, said cup being rotatable, a carriage movable about an axis parallel to the axis of rotation of the cup or holder, an arm pivotally connected to the carriage and movable about an axis at right angles to the axis of



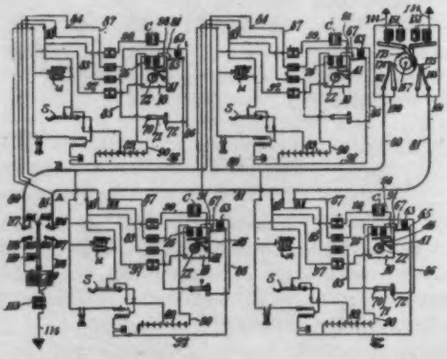
rotation of the carriage an adjustable contact screw carried by the arm in position to engage a crystalline mass carried by the holder, and opposing springs connected to the carriage and to the arm on opposite sides of the pivot of the latter.

918,852. Telephony. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio. In telephony, a party line system including an all metal circuit to which the local talking circuits are bridged, selecting means arranged at the local stations and connected in series in the limbs of the circuit,



means for grounding the opposite ends of the limbs of the circuit, a receiver hook switch at each station and means for locking the receiver hook switches at all stations except those of connected subscribers.

918,566. Telephone System. Ray H. Manson, Elyria, Ohio, assignor to The Dean Electric Company, Elyria, Ohio. In a signaling system, a source of signaling current, a device responsive to such signaling current, conductors for electrically connecting such device to such source of signaling current, a second electrical path between such conductors,



and means located on either side of the connection of such device to such conductors adapted to offer resistance to such signaling current varying inversely as the frequency of such current.

NEWS NOTES

FINANCIAL.

COALINGA, CAL.—The Lorene Oil Company nas levied an assessment of 3 cents per share on the capital stock of the company.

WASCO, CAL.—The Fourth Extension Water Company has levied an assessment of $1 per share on the capital stock of the company.

VISALIA, CAL.—The Lindsey Heights Water Company has levied an assessment of $3.50 per share on the capital stock of the company.

SAN LUIS OBISPO, Cal.—The Huasna Petroleum Company has levied an assessment of ½ per cent per share on the capital stock of the company.

PALO ALTO, CAL.—An election will be held in this city on May 22d to decide on the issuance of bonds to the amount of $53,000 for public improvements. A municipal street lighting system costing $3,000 is contemplated in the improvements.

SAN DIEGO, CAL.—The San Diego Gas & Electric Co. has increased its capital stock from $1,500,000 to $3,500,000. The bonded indebtedness of the company is increased to $6,000,000. Extensive improvements are soon to be made to the company's plant.

BAKERSFIELD, CAL.—The directors of the Associated Oil Company held a special meeting this week and voted a $25,000,000 bond issue. A pipe line from Coalinga to San Francisco Bay, another from McKittrick, in the middle of the west side oil fields of Kern County, to Gaviota, where the Associated refinery is situated, and a new tankship, are the improvements in contemplation at the present time. The pipe for the Coalinga line, which is 8-inch rifled, has been ordered and the new work will be started immediately. This construction work will represent an outlay of $6,000,000. The remaining $19,000,000 of the issue will be kept in the treasury for future use.

INCORPORATIONS.

LOS ANGELES, CAL.—The Texas Oil Company has been incorporated here with a capital stock of $450,000 by W. E. Noble, A. H. Smith and L. C. Russell.

FRESNO, CAL.—The Coalinga-London Oil Company has been incorporated here with a capital stock of $20,000 by W. E. Reilly, S. R. Adams and A. B. Shaw.

SAN FRANCISCO, CAL.—The Enos Oil Company has been incorporated here with a capital stock of $500,000 by W. A. Irwin, John Baker Jr. and J. C. McKinstry.

SAN FRANCISCO, CAL.—The Cholame Oil Company has been incorporated with a capital stock of $2,000,000 by H. B. Hayden, J. W. Cook, C. E. Gilman and E. L. Brune.

HANFORD, CAL.—The Valley Water Company has been incorporated here by A. Guthrie, J. A. Robertson, Edward Kauntze, F. P. Hooper, W. M. Graham and W. H. Hart.

SAN LUIS OBISPO, CAL.—The Indian Valley Oil Company has been incorporated here with a capital stock of $50,000 by E. Bergemann, J. F. Densmort and J. A. Johnson.

BAKERSFIELD, CAL.—The W. T. & M. Oil Company has been incorporated here with a capital stock of $500,000 by H. W. Thomas, W. B. Bealzley, H. E. Wright, W. M. Morris and T. M. Young.

SAN FRANCISCO, CAL.—The Cuyama Consolidated Oil Company has been incorporated here with a capital stock of $500,000 by E. A. Mero, E. C. Doherty and R. F. Marcum.

VENTURA, CAL.—The Hill Top Oil Company has been incorporated here with a capital stock of $100,000 by H. H. Younken, M. H. Butcher, Ira Martin, C. J. Mallard and others.

REDLANDS, CAL.—The Gladysta Mutual Water Company has been incorporated here with a capital stock of $10,000 by G. R. Stone, E. P. Whitney, W. C. Warner, H. A. Hargraves and others.

LOS ANGELES, CAL.—The Pacific Crude Oil Company has been incorporated here with a capital stock of $1,000,000 by M. P. White, G. E. Averill, F. D. McClure, J. R. Riggins and W. H. Shaw

HANFORD, CAL.—The Tulare Lake Irrigation Power Company has been incorporated here with a capital stock of $2,000,000 by A. C. Palladine, B. R. Palladine, J. W. Barbour, T. L. Hannah and C. W. Barrett.

SACRAMENTO, CAL.—The Sacramento & Sierra Railroad Company has been incorporated here with a capital stock of $1,000,000 by Charles A. Smith, Frederick A. Warner, Frederick H. Pierce, Harry Thorpe, Arthur E. Miller and Thomas Stevenson. The new road, which will be operated either by electricity or gasoline, will connect this city with Lake Tahoe. Work on the road between this city and the Orangevale Bluffs will begin before the end of May.

TRANSMISSION.

EUREKA, CAL.—Jesse Knight will construct an electric power plant in Santaquin Canyon, for operation of his smelter.

HOLLISTER, CAL.—Bids will be received by the Board of Supervisors up till May 17th for a power line franchise in this city.

HOLLISTER, CAL.—The San Benito Light & Power Company has begun work on the construction of its new power line from Logan to Hollister.

LOS ANGELES, CAL.—Bids are being received by the Board of Supervisors for furnishing this city with four 20 horsepower and four 10 horsepower direct current motors.

RED BLUFF, CAL.—Frank K. Wilson, representing the Sierra Power Company, has been granted a franchise to construct power lines along public highways in Tehama county.

OAKLAND, CAL.—The Great Western Power Company has let a $45,000 contract to the Thompson-Starrett Construction Company for the construction of a steel sub-station in this city.

SANTA ROSA, CAL.—The Snow Water & Power Company has awarded a contract to G. W. Nelson to construct 17.58 miles of electric line from Fulton to Guerneville at $300 per mile.

NEVADA CITY, CAL.—Dr. A. J. Tickell has filed claim for 50,000 inches of water in the Middle Yuba river for the purpose of generating electric power. He proposes to erect a large electric power plant on the river just above the Plumbago Mining Company's dam, where he will generate at least 500 horsepower. By this project the entire Graniteville, Allegheny and Forest district can easily be covered by power lines.

WATSONVILLE, CAL.—The Coast Light & Power Company is at work on its new line from this city to San Juan. In another week the company expects that this extension will be completed and the improvements on the Freedom and Green Valley lines will be commenced. The extension of the system from San Juan to Hollister is in the hands of the Hollister Light & Power Company, which company was recently purchased by M. Waller, of San Francisco.

TONOPAH, NEV.—The Nevada-California Power Company announces that by the latter part of May electric power will be in use at Pioneer. Contracts were closed last week with the Bullfrog-Pioneer Mining & Leasing Company to install a 50 horsepower electric hoist.

TRANSPORTATION.

MESA, ARIZ.—A franchise has been granted A. J. Chandler to construct an electric street railway in this city.

LOS ANGELES, CAL.—The Ontario & San Antonio Heights Railway Company has secured rights-of-way for its electric road between Uplands and Claremount, which it is estimated will cost $175,000.

SANTA ANA, CAL.—The Los Angeles-Pacific Electric Railway interests have signed a contract with the Southern California Sugar Company, whereby it binds itself to complete the electric road between Santa Ana and Huntington Beach before July 1st.

OAKLAND, CAL.—The Oakland Traction Company, on May 2d put in effect its new timetable on the Haywards, College and Shattuck avenue lines. Hereafter the Haywards cars will make their terminus at Twelfth and Broadway instead of Berkeley. The College and Shattuck avenue lines follow a shuttle system, each line alternating on the two streets, the terminals being Seventh and Broadway and Berkeley.

OAKLAND, CAL.—This week the San Francisco, Oakland & San Jose Railway Company began work on the construction of its Poplar street line, which will tap the central Oakland district. This extension is planned to be completed by the first of July, when single cars will form the connection with Broadway until regular train service is inaugurated. sixteen new cars, with a capacity of ninety passengers, are being constructed at the company's shops at Emeryville.

OIL.

COALINGA, CAL.—It is understood that John A. Bunting has sold the west half of the Shawmut Oil Company's property to John M. Wright of the Coalinga Peerless Oil Company.

COALINGA, CAL.—The Lucile Oil Company held a meeting this week and made several changes in the officers of the company. The vacancy caused by the resignation of Professor Carl Plehn, was filled by electing J. R. Webb. Secretary H. K. Palmer, who also resigned recently, was succeeded by J. R. Davis. A new oil cleaning system, called the Speed system, has been installed and has proven highly satisfactory for the first unit. A second unit is being installed this week and a third will be put in soon. Each unit is capable of handling 500 barrels per day. With the three units the company will be enabled to clean 1,500 barrels per day. The company has about 40,000 barrels of oil in its sumps, which will be taken away at once by the Associated Oil Company on its contract at 55 cents per barrel. There is still about 150,000 barrels to be delivered.

WATER.

LONG BEACH, CAL.—The Long Beach Water Company has awarded a contract to the Lacey Manufacturing Company, for $14,120, to furnish steel for the construction of the American avenue cement pipe line.

SAN LUIS OBISPO, CAL.—Bids will be received by the Board of Trustees up till May 10, 1909, for furnishing this city water pipe and fittings.

SAN DIEGO, CAL.—The Board of Public Works has passed a resolution recommending the City Council to adopt an ordinance appropriating $72,133.13 to lay water mains in various sections of the city.

OAKLAND, CAL.—Extension of the new auxiliary fire fighting salt water pumping plant to include the most hazardous section of the business district has been recommended by the Board of Public Works to the City Council for the necessary appropriation. The pumping station at Lake Merritt is nearly completed. Two engines, aggregating 600 horsepower, are ready for installation. There is space in the station for a third engine of 300 horsepower. At its capacity the power will equal on direct pressure the work of 18 to 20 of the average steam fire engines used in this city. The two engines to be installed at the station will equal the work of 12 fire engines. The streams will be powerful enough to throw over the highest building in the business district. Standpipes will be set at intervals throughout the protected district and the water will be pumped directly. They will be powerful enough to smash through an ordinary brick wall, if necessary, to hit into the heart of a burning structure. Besides this arrangement has been made to extend the spur pipe to the water's edge on the estuary, to which any one of the half dozen fire boats in the harbor can attach, in case of need, and supply an enormous additional pumping capacity from the estuary waters. This will be of vast protective benefit in case of conflagration in the lumber yard and mill district along the water front. The volume of water thus made available will be so great that fear of a general destructive fire will be almost nullified.

TELEPHONE AND TELEGRAPH.

LENTS, ORE.—A telephone and construction company has been formed here by A. J. Marshall.

JACKSONVILLE, ORE.—The Citizens Telephone Company has been granted a 20 years' franchise.

BAKER CITY, ORE.—J. L. Bisher has a franchise for a telephone line between Richland and Robinett.

SALEM, ORE.—The Mehama Telephone Company of this county has filed a petition in the county court asking permission to build a number of telephone lines.

STEVENSVILLE, MONT.—Operations are soon to be begun by the Montana Independent Telephone Company, who will connect Stevensville with Missoula.

RENO, NEV.—The Postal Telegraph-Cable Company has begun operations for the extension of its lines from Reno to San Francisco by filing a suit for the condemnation of rights of way on land belonging to the Southern Pacific and Central Pacific Railroads across the State of Nevada.

BAKERSFIELD, CAL.—The Farmers' Mutual Telephone Association has been incorporated to take charge of several of the farmers' lines in this locality and insure better service. The company is capitalized at $4,000 and the incorporators are W. W. Frazier, R. S. Ashes, D. Hirshfield, Milo G. McKee and James Herod.

RIVERSIDE, CAL.—The incorporation of a new company to be known as the Corono Union Telephone Company, has just been announced. The company is capitalized at $25,000, and the incorporators are J. G. Jameson, E. J. Generaux, G. E. Snedecor, C. M. Scoville, W. L. Peeler, H. A. Prizer and Daniel Lord.

ILLUMINATION.

COALINGA, CAL.—A. W. Smith and S. H. Hain were this week granted a gas franchise in this city.

SAN DIEGO, CAL.—A contract for installing ornamental light posts on certain public thoroughfares in this city has been awarded to the Standard Iron Works, of San Diego.

PASADENA, CAL.—The City Council has passed an ordinance authorizing the purchase of $45,000 worth of engines, generators and other electrical machinery for the proposed municipal lighting plant in this city.